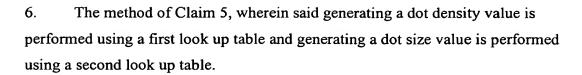## CLAIMS

What is claimed is:

1.   A method of halftoning an image, said method comprising:

            modulating the dot density of said image; and

5   modulating the dot size of printed dots to obtain a printed halftone image.

2.   The method of Claim 1, further comprising:

            inputting an input pixel value for a pixel location;

            wherein said modulating the dot density modulates the spacing of the

10   dot to be printed for said pixel location with respect to preceding and subsequent pixel locations and said modulating the dot size modulates the size of said dot to be printed for said pixel location.

3.   The method of Claim 1, further comprising:

            inputting an input pixel value for a pixel location within said image;

15   wherein modulating the dot density of said image comprises controlling the dot density for said pixel location within said image using said input pixel value and performing dispersed dot halftoning to produce a dot position based on said dot density.

4.   The method of Claim 3, wherein said modulating the dot size of said image

20   comprises controlling the dot size for said pixel location within an image using said input pixel value and performing dot size modulation based on said dot size and said dot position.

5.   The method of Claim 4, wherein controlling the dot density for said pixel location comprises generating a dot density value based on said input pixel value, said

25   dot density value being used to perform said dispersed dot halftoning, and wherein said controlling the dot size for said pixel location comprises generating a dot size value based on said input pixel value, said dot size value being used to perform dot size modulation.

6.   The method of Claim 5, wherein said generating a dot density value is performed using a first look up table and generating a dot size value is performed using a second look up table.

7.   The method of Claim 4, wherein controlling the dot density for said pixel location and performing dispersed dot halftoning are performed in a first integrated process and controlling the dot size for said pixel location and performing dot size modulation are also performed in a second integrated process.

8.   The method of Claim 4, wherein said modulating the dot size of said image further comprises diffusing at least a portion of the dot size for the pixel location to at least one subsequently processed pixel location.

9.   The method of Claim 1, wherein said modulating the dot density is performed using at least one of error diffusion, dispersed dot screening, and iterative search based halftoning.

10.   The method of Claim 2, wherein said modulating the dot density is performed using tone dependent error diffusion.

11.   The method of Claim 10, further comprising:
        generating a dot density value based on said input pixel value, said dot density value being used in said tone dependent error diffusion;
        said tone dependent error diffusion, comprising:
                combining said dot density value with at least one previous error value to produce a modified pixel value;
                comparing said modified pixel value with a threshold value to produce a halftone value for said pixel location; and
                using said halftone value for said pixel location to produce an error value that is diffused to at least one subsequently processed pixel.

12.   The method of Claim 1, wherein said modulating the dot size is performed using pulse width modulation.

13.   The method of Claim 12, wherein said pulse width modulation provides a first value indicating the width of the pulse and a second value indicating the justification of said pulse within a pixel location.

14.   The method of Claim 13, wherein when a printed dot is larger than one pixel, 5 the pulse within adjacent pixels are justified together so that the dot may be formed with one continuous pulse.

15.   A method of printing a halftone image, said method comprising:

            inputting an input pixel value for a pixel location within an image to be printed;

10   generating a dot density control value using said input pixel value for said pixel location;
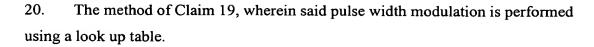
            producing a halftone value for said pixel location using said dot density control value;

            generating a dot size control value using said input pixel value for said 15 pixel location; and

            producing a size modulated halftone value for said pixel location based on said dot size control value and said halftone value.

16.   The method of Claim 15, wherein said producing a halftone value for said pixel location also uses accumulated errors diffused from at least one other pixel 20 location and provides an error for said pixel location to be diffused to at least one subsequently processed pixel location.

17.   The method of Claim 15, wherein said producing a halftone value for said pixel location is performed using tone dependent error diffusion.

18.   The method of Claim 15, wherein generating a dot density control value is 25 performed using a first look up table and generating a dot size control value is performed using a second look up table.

19.   The method of Claim 15, wherein said producing a size modulated halftone value is performed using pulse width modulation.

20.   The method of Claim 19, wherein said pulse width modulation is performed using a look up table.

21.   The method of Claim 15, further comprising diffusing at least a portion of said dot size value for the pixel location to at least one subsequently processed pixel
5   location.

22.   A method of optimizing a dot size look-up table and a dot density look-up table for a printing system that uses dot size modulation and dot density modulation, the method comprising:

            printing at least one test page showing the combinations of dot sizes
10   and dot densities;

            measuring the output absorptance for each combination and the print distortion for each combination;

            determining the print distortion at each output absorptance using the measured output absorptance and the measured print distortion for each
15   combination;

            calculating the optimized dot size look-up table using the print distortion at each output absorptance; and
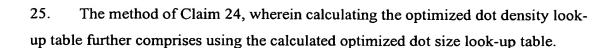
            calculating the optimized dot density look-up table using the print distortion at each output absorptance.

20 23.   The method of Claim 22, wherein determining the print distortion comprises:

            inverting the output absorptance for each combination to compute the value of the dot density required to produce each output absorptance; and

            using the inverted output absorptance and the print distortion for each combination to determine the print distortion as a function of output
25   absorptance.

24.   The method of Claim 22, wherein calculating the optimized dot size look-up table comprises minimizing a cost function of the print distortion at each output absorptance as a function of dot size.

25.   The method of Claim 24, wherein calculating the optimized dot density look-up table further comprises using the calculated optimized dot size look-up table.

26.   A printing system including a printer and a computer, the printing system printing a dot density and dot size modulated image, the method performed by the printing system comprising:

    performing dispersed dot halftoning for a pixel location based on an input pixel value for said pixel location;

    performing dot size modulation for said pixel location based on the results of said dispersed dot halftoning and said input pixel value.

27.   The image forming device of Claim 26, wherein the printer is one of an electrophotographic printing device, electrophotographic copying device, and an inkjet printer.

28.   An image forming system comprising:

    a computer;

    a printing device coupled to said computer;

    a computer program executed by said computer, wherein said computer program comprises computer instructions for:

        receiving an image;

        modulating the dot density of said image; and

        modulating the dot size of printed dots to obtain a halftone for said image.

29.   The image forming system of Claim 28, wherein:

    receiving an image comprises receiving an input pixel value for a pixel location within said image;

    modulating the dot density of said image comprises generating a dot density control value using said input pixel value for said pixel location and producing a halftone value for said pixel location using said dot density control value; and

    modulating the dot size comprises generating a dot size control value using said input pixel value for said pixel location and producing a size

modulated halftone value for said pixel location based on said dot size control and said halftone value.

30.   The image forming system of Claim 29, wherein said producing a halftone value for said pixel location comprises adding at least a portion of accumulated errors from at least one other pixel location with said dot density control value and diffusing an error for said pixel location to at least one subsequently processed pixel location.

31.   The image forming system of Claim 28, wherein said computer is a microprocessor.

32.   The image forming system of Claim 28, wherein said image forming system is one of an electrophotographic printing device, electrophotographic copying device, and an inkjet printer.

33.   An image forming device comprising:

        a dot density control unit;

        a dot size control unit;

        a dispersed dot halftoning unit coupled to said dot density control unit; and

        a dot size modulation unit coupled to said dispersed dot halfoning unit and said dot size control unit; and

        a printing device coupled to said dot size modulation unit.

34.   The image forming device of Claim 33, wherein:

        said dot density control unit is configured to receive an image and produce a dot density value for at least a portion of said image;

        said dot size control unit is configured to receive said image and produce a dot size value for said at least a portion of said image;

        said dispersed dot halftoning unit is configured to receive said dot density value and produce a halftone value for said at least a portion of said image;

        said dot size modulation unit is configured to receive said halftone value and said dot size value and produces an output signal representing said

halftone value and a modulated size value for said at least a portion of said image;

   said printing device is configured to receive said output signal and print said at least a portion of said image.

5 35. The image forming device of Claim 33, wherein said dispersed dot halftoning unit is a tone dependent error diffusion unit.

36. The image forming device of Claim 33, further comprising a dot size diffusion unit coupled to said dot size modulation unit.

37. The image forming device of Claim 33, wherein said dot density control unit
10 is integrated into said dispersed dot halftoning unit.

38. The image forming device of Claim 33, wherein said dot size control unit is integrated into said dot size modulation unit.